

ABSTRACT OF THE DISCLOSURE

The spectral kernel machine combines kernel functions and spectral graph theory for solving problems of machine learning. The data points in the dataset are placed in the form of a matrix known as a kernel matrix, or Gram matrix, containing all pairwise kernels between the data points. The dataset is regarded as nodes of a fully connected graph. A weight equal to the kernel between the two nodes is assigned to each edge of the graph. The adjacency matrix of the graph is equivalent to the kernel matrix, also known as the Gram matrix. The eigenvectors and their corresponding eigenvalues provide information about the properties of the graph, and thus, the dataset. The second eigenvector can be thresholded to approximate the class assignment of graph nodes. Eigenvectors of the kernel matrix may be used to assign unlabeled data to clusters, merge information from labeled and unlabeled data by transduction, provide model selection information for other kernels, detect novelties or anomalies and/or clean data, and perform supervised learning tasks such as classification.

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